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A Curse of Comparison?

Evidence on Reference Groups for Relative Income Concerns

Alice Kuegler

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Abstract

This paper proposes that individuals care about the relative income of proximate reference groups. Making use of self-reported life satisfaction as a proxy for unobservable utility, the relative income of siblings is tested for relevance as a reference point for new sample data from Venezuela. Having greater perceived income than one's siblings is found to be positively linked to individual life satisfaction. This evidence supplements the scarce economic research on reference groups, supporting the hypothesis that individuals with proximate characteristics and resembling opportunities in life serve as points of comparison.

This paper—a product of the Development Economics Vice Presidency—is part of a larger effort in the department to analyze policy-relevant topics rigorously with the best available information to support decision making. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at akuegler@worldbank.org.

A Curse of Comparison?
Evidence on Reference Groups for Relative Income Concerns

Alice Kuegler*

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* The author is with the World Bank, Development Economics Policy Review Team. Address for correspondence: akuegler@worldbank.org.
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Introduction

For a long time the view of utility as an absolute concept has permeated economic theory. By not accounting for comparative concerns this tradition has limited economic explanations of empirical phenomena. Over the last years, the economic literature has therefore increasingly questioned the reluctance to model relative utility, influenced by extensive research in other disciplines such as psychology, sociology and biology. While relative concerns have been found important for utility in a number of empirical studies, few of these studies address the question of relevant reference groups in more detail. Most research uses objective average income data of relatively distant comparison groups instead of more suitable perception data which contain information about proximate comparisons.

This paper proposes that individuals compare themselves with those most similar to themselves and whom they know about. Using data on perceived relative income by siblings allows testing for the relevance of a most proximate reference group. For respondents in the sample, having higher income relative to one's siblings has a significant positive effect for life satisfaction. When the sample is split in different sub-samples, this positive effect is only robust for individuals with income above the sample median, or for respondents who work in managerial professions. These findings support an interpretation of increasing relative rank concerns with higher income and professional achievement. The overall relevance of siblings' relative income is a new contribution to the literature on relative income.

Siblings have in general similar circumstances and opportunities in life and their personal characteristics are well-known to individual survey respondents. Making use of individual perception data resolves problems of asymmetric information that will occur if estimation data consists of objective income averages. Siblings also have the advantage of being an exogenous reference group in contrast to groups that individuals can endogenously choose to accommodate relative rank preferences.

In a utilitarian tradition[1], this paper approximates utility by exploiting data on subjective life satisfaction in Venezuela. The author and a co-researcher asked a diversified sample of 400 Venezuelans to report their satisfaction with life. In order to test for the significance of perceived relative income of reference groups, a specific questionnaire was constructed to collect data on subjective relative income of siblings, parents, friends, and of the individual itself in the past. Using data from a middle-income country, the sample avoids the dominance of extremes in the data, such as wide-spread poverty at subsistence levels or post-materialist concerns on the other side of the spectrum.

The paper is organized in five sections. Following this introduction, Section 1 outlines the conceptual approach of the analysis and presents previous findings in the life satisfaction literature, which inform the model estimated. Section 2 gives an overview of the use of reference points in previous research and in this paper. The data used for the empirical analysis is described in Section 3. Section 4 discusses the model, presents the estimations, and provides an interpretation of the results. Section 5 concludes.

1. Conceptual Approach

1.1 *Self-Reported Life Satisfaction as a Measure of Income Utility*

In economics the dominant tendency has been to refer to preferences 'revealed' in market exchanges to measure utility derived from income. As a consequence, higher absolute income translates into higher consumption, which is equated with higher utility. This conventional view has severe shortcomings, for instance, if individuals derive utility from relative standing or status. Market purchase data also fail to adequately

[1] Traditionally, utilitarians like Bentham (1789) related the term 'utility' with happiness. In this paper, the terms 'utility', 'happiness', 'life satisfaction' and 'well-being' are consequently used interchangeably in the discussion of the literature. 'Life satisfaction' was deliberately chosen as wording in the questionnaire instead of 'happiness', as it is seen to better reflect the constant, overall notion of happiness which is of interest when approximating utility.

describe effects of influences such as pollution, crime, or social unrest on the utility function (Sen, 1985). While reported life satisfaction measures can have advantages, these could be compromised by the unreliability of self-rated life satisfaction if reporting is strongly affected by current mood (Schwarz and Strack, 1999). Research has shown, however, that *subjective* measures of life satisfaction are closely associated with more *objective* indicators of happiness, such as brain activity, smiling, blood pressure and measures of stress. Eid and Diener (2004) conclude that in normal testing situations, the stable components of life satisfaction levels overshadow the effects of current moods.

To enable an interpersonal aggregation of individual reports of life satisfaction in this paper, the choice of a life satisfaction scale with four categories was imposed on all individuals, in a similar fashion to democratic voting processes. To enable the following analysis, it is assumed that a single category such as 'very satisfied' carries the same meaning for every individual included in the sample.

To test the relevance of reference groups in relative income concerns, the model estimated in this paper includes a range of control variables that were chosen based on the findings of previous life satisfaction research. Table A.1 in the Appendix lists the variables used in the model estimations. These variables capture information such as relative and absolute income, employment, health, education, experienced crime, and social and political participation. In the literature, good health is a strongly positive factor for reported life satisfaction (Easterlin, 2003; Ferrer-i-Carbonell and Frijters, 2004). In addition to good health, individuals with more education tend to be happier (Diener *et al.*, 1999). A U-shaped relationship between education and life satisfaction was reported by Kingdon and Knight (2007), and by Graham and Pettinato (2002a), which is translated into the model estimated in Section 4 by including a quadratic term for the variables *Years of education*. The results of Frey and Stutzer (2005) for Switzerland indicate that direct participation in public decision making, for instance, via popular referenda significantly contributes to happiness. The variable *Political participation* was therefore included in the model, also as a quadratic term to allow for a U-shaped effect. Measures of social capital such as trust and support networks also seem to have substantial effects on well-being (Helliwell, 2006).

An important negative influence on satisfaction levels is unemployment, and unemployed individuals suffer in excess to the decrease in income resulting from job loss (for instance, Clark and Oswald, 1994; Oswald, 1997; Winkelmann and Winkelmann, 1998; Di Tella *et al.*, 2001). Research also shows that inflation has substantial negative effects on well-being (Frey and Stutzer, 2002a; Di Tella *et al.*, 2001; Graham and Pettinato, 2001) as has crime (Powdthavee, 2005; Kingdon and Knight, 2007). Most studies have found that individuals with higher absolute income report higher life satisfaction at a point in time (Graham and Pettinato, 2002b; Frey and Stutzer, 2002a).

A large number of empirical findings indicate that framing income utility as an absolute concept does not adequately reflect reality. For time-series, for instance, Easterlin has described the so-called 'Easterlin paradox' by showing that the positive relationship between income and life satisfaction does not hold over time (Easterlin, 1974, 2001).[2] An explanation for this phenomenon could be that individuals adjust their aspirations with growing prosperity. Another likely reason is that income influences life satisfaction in a relative sense. The model estimated in Section 4 therefore includes relative income variables in addition to absolute income.

1.2 *Positional Concerns in Previous Research*

The idea that individuals derive utility from their position relative to a specific reference group goes back to Veblen (1899) and Duesenberry (1949). In an empirical survey of 257 Harvard University faculty, students and staff, Solnick and Hemenway (1998) confirm relative concerns by showing that half of respondents preferred to have 50% less real income but high relative income. Frank (2005) argues that the significance of

[2] In the United States per capita income over the period 1946 to 1991 more than doubled, but self-reported happiness stayed approximately constant. Similarly paradox results have been described for member countries of the European Union (Di Tella *et al.*, 2001), Switzerland, and Japan (Diener and Suh, 1997; Frey and Stutzer, 2002b).

relative standing can be traced to biology. In a Darwinian view, natural selection will favour those humans that are fitter in relative terms, so that humans are biologically programmed to value relative position in addition to basic absolute consumption. The direction of relative effects on life satisfaction is unlikely to be the same at all levels of income. Risk mitigation and consumption smoothing mechanisms can produce a positive effect of lower relative income for life satisfaction. Such positive externalities of relative income have been found to dominate comparative status concerns at subsistence levels of income (Ravallion and Lokshin, 2005).

Among a handful of economists, Ljungqvist and Uhlig (2000) have shown that optimal economic policy significantly changes when utility depends also on positional concerns. Externalities are likely to result from status considerations, for instance, Dupor and Liu (2003) note that jealousy will lead to consumption externalities at any equilibrium level of consumption. The critical implications of relative concerns for economic models are not confined to consumption. Reference-dependent utility functions, for example, will determine risk attitudes as Kőszegi and Rabin (2007) demonstrate in their theoretical paper.

While these advances highlight the significance of relative income, relatively little research has analyzed the relevance of specific reference groups and their influence on income utility. Postlewaite (1998) argues that the reluctance to include relative concerns into utility models comes from the wide range of behaviors that these allow, and consequently the limited ability to place restrictions on equilibrium behavior. More generally, a lack of knowledge about relevant reference groups, reinforced by a lack of adequate data for empirical analysis, seems to contribute to the persistence of economic models that do not incorporate relative concerns.

In the absence of precise knowledge on reference groups, however, a number of studies have proceeded to incorporate relative income of assumed reference points. One branch of the research has used endogenously formed reference points, such as individual's rational expectations held in the recent past (Kőszegi and Rabin, 2006). Falk and Knell (2004) assume that individuals endogenously choose their reference standards, informed

by downward and upward comparisons to serve motives of self-improvement and self-enhancement. Relating reference and actual incomes to subsequent income growth for panel data on male physicians, Rizzo and Zeckhauser (2002) define reference incomes by asking: "Considering your career stage, what do you consider to be an adequate income […]?"

By contrast, a number of papers assume that objective income in the area of residence is exogenous, and use objective income data to test for the significance of these imposed reference groups. Such measures of objective relative income prove significant in most of these studies (amongst others, Ravallion and Lokshin, 2002; Knight and Kingdon, 2007), which may indicate a certain overlap between objective and perceived levels of comparison income. Luttmer (2005) shows that neighbors' income has a negative influence on life satisfaction. 'Neighbors', however, are defined as the inhabitants in an individual's microdata area consisting on average of 144,000 people, a group larger than most individuals would perceive as their neighbors, or of whom they could accurately assess average income. Ferrer-i-Carbonell (2005) narrows down comparison groups by using the objective average income of a reference group which she defines by education, age and region.

In rural areas the village is likely to serve as reference group to a certain extent and some papers use average village income as reference income. In a survey of rural households in China, Knight *et al.* (2007) asked individuals whom they compare themselves to, and found that for 40% of respondents their village serves as reference group. The village was the largest reported reference group, while the given category of aggregate 'relatives' was the main comparator group for only 7% of respondents. Those individuals who reported their income to be above the village average, were found to be much happier than those with income below the village average. Stark and Taylor (1991) also use village income as reference level in a relative deprivation model of migration. In an analysis of 423 individuals in Mexico, they find that relative deprivation within one's village has a significant impact on migration from Mexico to the USA. This effect does not hold for internal migration, which the authors relate to the

higher likelihood of reference group substitution when migration takes place within Mexico.

Ravallion and Lokshin (2005) use perceived relative consumption by friends, by neighbors, and in the enumeration area as reference levels for perception data from Malawi. The authors assume that comparison-group welfare is unlikely to be endogenous, as in a low income country like Malawi individuals have less freedom in choosing their location and hence neighbors and friends than in a developed country. Ravallion and Lokshin find that in rural Malawi, where subsistence poverty is wide-spread, the positive effects of better-off friends and neighbors dominate rank concerns. Negative externalities are a concern only for the comparatively better off.

2. A Simple Model with a Proximate, Exogenous Reference Group

To build more realistic models, it is critical to refine our knowledge about reference groups that influence utility. Bias can be avoided if reference groups are exogenous as is the case for one's siblings, and if data is available for perceived relative income.

This paper proposes that individuals are likely to form reference points according to proximity in characteristics and interaction. The hypothesis is that individuals compare their incomes to the incomes of people with resembling traits and opportunities, and about whom they have sufficient information. This accords with the social psychologist Festinger (1954) who argued that the tendency to compare oneself to others is a decreasing function of relative differences.

In addition, it is likely that relative status matters more for groups whose members are fully informed about each other. For instance, Frank (1984) illustrates that the price of status is highest in professional groups whose members interact most intensively. Two papers assess the significance of relative income of proximate, exogenous comparator groups. Clark (1996) shows that measures of job satisfaction are strongly negatively correlated with both objective spouse's income and the average income of all other

workers in the household for data from the British Household Panel Study. Neumark and Postlewaite (1998) introduce relative income concerns into women's labor supply function and find that a woman whose husband earned less than her sister's husband was 16% to 25% more likely to look for paid employment.

While a certain degree of heterogeneity of reference groups is likely to be unavoidable especially in more broadly representative samples, some social arrangements are more stable than others. In addition to informational attributes, a specific advantage of reference groups composed by siblings and relatives is that they are also fairly stable.

In the model proposed, utility derived from income is a function of income relative to the income of a reference group, y_r, and of absolute income y_i.

$$U = U\,(y_r, y_i)$$

Utility is increasing in y_i, and after a certain income threshold increasing in one's income relative to a reference group, y_r.

$$\partial U/\partial y_r > 0 \qquad \text{and} \qquad \partial U/\partial y_i > 0$$

For income at subsistence poverty levels, utility is decreasing in y_r.

$$\partial U/\partial y_r < 0$$

It is further proposed that reference relevance is a declining function of resemblance factors and proximity to the comparison group. Accordingly, comparison points such as siblings, parents, oneself in the past, and friends promise to be reference relevant, which will be tested in Section 4. The data available will be indicative of direction and significance of effects, but does not provide the detail for more precisely estimating the shape of the sample's income utility curve. While individuals are likely to care about comparisons in other dimensions, the focus of this paper is on income.

3. Data Description

The data used in the estimations consist of a sample of 400 Venezuelan individuals. These individuals were approached by the author of this paper and a co-researcher in summer 2005 and asked to respond to a standardized questionnaire.[3] The dependent variable was derived from the question: "In general, how satisfied are you with your life these days?" Four answers were possible – 'very satisfied' (4), 'satisfied' (3), 'not very satisfied' (2), and 'not satisfied at all' (1). Definitions for all relevant variables as well as sample summary statistics are listed in table A.1 in the Appendix. The percentages of individuals in each life satisfaction category are displayed in table 1, which also illustrates the reported satisfaction levels for selected subgroups.

While the sample stratification was not formalized by means of a sampling frame, the sample was approximately stratified by income and location. Individuals were approached roughly according to the income and location criteria in bus stations, shopping malls, town squares, at the beach, in restaurants, in hospital waiting rooms, near universities, in their homes, and at work. This strategy has produced a sample with means that exhibit relatively close overlaps with the national means for the Venezuelan population.[4]

As questionnaire responses have been found to depend on the ordering of questions (Bertrand and Mullainathan, 2001), this questionnaire was constructed with the aim to

[3] The data collection was carried out by the two researchers in Venezuela from July 11 to August 29 2005. English and Spanish versions of the questionnaire are available from the author at request.

[4] The sample is comprised by individuals aged 17 to 80 years with a median age of 32 years. In comparison, the median age of the Venezuelan population above 15 lies between 30 and 34 years (United Nations, 2006). While women account for 50% of the population, 52% of sample respondents are women. In the sample, individuals report to live on average in households that consist of 4.75 members, whereas the national average household size for the first semester of 2005 is 4.34 (Instituto Nacional de Estadística, 2006). In a question about their attitude toward the government, 55% of the individuals in the sample answered that they approve of President Hugo Chávez. Election outcomes from August 2004 show that 59% of voters supported Chávez in a recall referendum, while 41 percent polled for new elections and the abstention rate was at 30% (Consejo Nacional Electoral, 2004).

avoid such bias. In particular, the question on life satisfaction was placed before other questions that could influence the response, such as those about satisfaction with family and living conditions, or about political attitudes. During the data collection, an effort was made to diminish the importance of literacy for inclusion in the sample, by offering individuals the choice to either fill out a questionnaire themselves or to answer the same questions in an interview. Consequently, 17 interviews were conducted.

Various income variables are contained in the questionnaire. To capture relative income positions, individuals were asked whether their income now is better than their own income ten years ago, whether they are better off than their friends, and their siblings, and if their living standard is higher than that of their parents when they had the same age as the respondent. Living standards were used in place of parents' past income to avoid measurement errors from confusing real and nominal values of income. While employing dummy variables to establish these relative positions does not allow for fine-tuned measurement, many respondents were not able to answer when asked about the perceived amount of average income of reference groups in bolívares, and the dummy is at least a clean measure of the perceived income position relative to different groups. Asking for perceived relative income was seen to best reflect individually experienced rank, avoiding asymmetric information problems that occur when objective income numbers are used for the estimations.

To derive an absolute income variable, individuals were asked to specify their monthly income in Venezuelan bolívares.[5] The information available for the income variable is incomplete as 128 observations are initially missing. In order to make use of a fuller sample in the estimations in Section 4, missing income observations are extrapolated for employment category subsets. Table A.2 in the Appendix details the exhaustive list of replacements by employment profiles and respective average incomes. In order to account for the replacement of missing income observations in the regressions, a discrete variable is created that takes value one when income has been replaced by an employment category average and zero otherwise.

[5] In July and August 2005 one US dollar was approximately equivalent to 2,300 bolívares.

Further income information is contained in the data in the form of a discrete choice variable, which takes value one when an individual reported that income is insufficient and there are many difficulties to cover basic needs. More detailed income data that, for instance, includes information on household assets, savings, expected future income or income-of-kind would be likely to further sharpen the precision of the estimation results, but is not available for this sample.

The questionnaire also includes a range of demographic variables, as well as geographic dummy variables to capture potential local area characteristics. Table A.1 lists the variables that were used in the estimations presented in this paper. In developing countries, those unemployed who are in a position of being able to formally claim unemployment benefits, are often relatively privileged. As a result, the variable *Not employed* was chosen in the estimations to better capture distress commonly associated with unemployment in the sense of not being formally employed. The discrete variable *Maracaibo* takes value one when the respondent lives in Maracaibo, Venezuela's second largest city, where most of the country's oil production takes place.

The political environment in Venezuela is polarized, and at the time of the survey used in this paper many Venezuelans tended to either strongly support or oppose the government of President Hugo Chávez. To account for this politicized context, a dummy variable for approval of the President and a variable for political participation are included in the model. In order to distinguish between ordinary students and individuals who are students in one of the government's recently introduced education programs for the poor, the binary variable *Student above 30* was defined to take value one when a respondent indicated to be a student and is above 30 years of age.

When employing the sample of 400 Venezuelans in multivariate regression analyses, missing observations decrease the sample size in spite of the replacement of missing income observations by employment category averages. Even in parsimonious model specifications the sample size drops to below 300. To avoid this decrease in sample size, modified zero-order regressions are estimated (Greene, 2003), and for this purpose three

discrete variables are created that take value one when a missing observation is replaced by zero, and value zero in the case of no replacement.

4. Empirical Model and Findings

4.1 *Testing for Reference Groups*

To test the proposition of Section 2 that siblings are relevant as comparison group, a variable on income relative to siblings is used in the model along with relative income variables for own past income, parents' income in the past and friends' average income. Of these, siblings and parents are exogenous reference groups. In addition to the relative income variables, absolute income in 1,000 bolívares and the discrete absolute income variable *Income highly insufficient* enter the function. A vector with control variables, which have been identified as important in previous research as outlined in Section 1.1, is also included in the model.

Reported life satisfaction is treated as an ordered categorical variable, so that higher self-rated life satisfaction levels reflect higher latent well-being of the respondent without assigning a cardinal value to the reported levels. An ordered probit model is used for the estimations, which preserves the ordinal nature of the 1 to 4 scale for reported life satisfaction. The resulting model estimated is a utility function where reported life satisfaction *LS* depends on proxies for relative income y_r, for absolute income y_i, and a set of control variables *X*.

$$LS = f(y_r) + f(y_i) + f(X)$$

The estimation results of the model are presented in table 2. Out of the four reference group variables in specification (1) only *Siblings worse off* is significant for life satisfaction. All other things equal, an individual is on average significantly more satisfied if the respondent earns more than his or her siblings on average. If own income was worse in the past, or if parents were worse off when they were the same age as the

respondent, variable coefficients are also positive but statistically insignificant. The insignificance of these two sequential relative income variables points to a 'curse of comparison', where negative externalities are likely to arise from comparing oneself with a contemporaneous reference group. The effect of friends having less average income would be negative, but is likewise insignificant. Absolute income in bolívares is insignificant at all standard levels of statistical significance[6], while the variable for insufficient income is significant at the 5% percent level and strongly negative.

Own income in the past could be insignificant as a measure of reference income, if individuals have adjusted their aspirations according to expected income. The living standard of parents in the past may not be considered relevant for relative status, if parents are seen to have grown up under different conditions with different opportunities. The fact that friends are a group that is more endogenously chosen could influence the variable's insignificance, which is further discussed in Section 4.2.

Absolute income may be insignificant because other included variables sufficiently describe aspects correlated with absolute income that affect life satisfaction, such as education, health or relative concerns. For instance, it is likely to be the case that richer individuals tend to earn higher relative income than poor respondents. In this sample, 33% of individuals reporting above-median income earn more than their siblings, while only 19% of respondents with below or equal to median income have siblings that are worse off. An alternative explanation is attenuation bias that can be caused by measurement errors (see Section 4.2).

To address potential endogeneity problems that arise from omitted personal characteristics, a proxy variable for the personality trait 'optimistic' is included in the estimations. Optimism is proxied by a discrete variable that takes value one if the

[6] To account for the possibility of mis-specification of the monthly income variable as its insignificance contradicts the findings of previous studies, the model was re-estimated including an additional squared term of monthly income. The models were also re-estimated for a subset of non-zero natural-log transformed income observations. These transformations still yield insignificant coefficients on absolute monthly income.

respondent believes that the Venezuelan economy will perform better in the future than now. This proxy variable is significant and positive.

Of the control variables, very good physical health, satisfaction with ones' living conditions and family situation, and the amount of contact with friends per week are all significant and positively linked with life satisfaction. The coefficients on inflation perceived as a problem and on attacks suffered during the last year, are also significant and as expected they are negatively related to reported life satisfaction. Even though *Not employed* enters the function with a negative sign, it is not significant at standard levels of statistical significance. To allow for a non-linear relationship, the variables on political participation and for years of education are included in the model with a level and a square term, in the same way as years of education. The results in table 2 indicate that the U-shaped relationship is significant for both variables. The discrete variable for respondents who live in oil-rich Maracaibo is positive and also significant, and is likely to capture specific local area characteristics.

For a more parsimonious model, the three insignificant reference group variables are dropped in model specification (2). All coefficients exhibit the same sign as in (1), and significant variables remain statistically significant. In order to test the robustness of the *Siblings worse off* variable, the model was re-estimated in (3) without replacing missing income observations and by carrying out zero-order regressions as explained in Section 3. As a consequence, in estimation (3) the sample size drops to 188. While the sample is substantially different from the one used in (2), *Siblings worse off* is strongly significant, with an even larger positive coefficient.

As Lokshin and Ravallion (2005) have highlighted, at very low levels of income the significance of relative income and reference groups is likely to reflect concerns about consumption sharing. Such sharing mechanisms would imply that worse relative income of a reference group has a negative effect on life satisfaction. To assess this influence contrasting the positive effect of worse reference group income due to rank, the sample was split at the sample median income of 420 bolívares. Sample median income is only

20 bolívares above the Venezuelan minimum wage set at 400 bolívares during the time of the data collection, and serves to define a poorer and a richer sub-sample.

Estimation (4) in table 3 reports estimation results for the sub-sample of individuals with below-median income, and estimates for respondents with above-median income are listed in (5). For the above-median income sub-sample in (5), *Siblings worse off* is strongly significant with an even larger coefficient than estimated for the full sample in (2). By contrast, the same coefficient becomes negative for the below-median income sub-sample in (4), but is insignificant. While these sub-samples are relatively small, the results support previous findings of a reversing relationship between relative income and life satisfaction at different levels of income, and mechanisms such as risk sharing arrangements are likely to dominate rank considerations at lower levels of income.

Like for respondents with higher income, income relative to one's siblings' will be important for other sub-groups of individuals who do not rely on others for consumption smoothing. In an attempt to further test this proposition, two sub-samples were defined according to professional activities for the estimations presented in table 4. The sub-sample used in estimation (6) only contains individuals who work in non-managerial positions.[7] By contrast, the sub-sample of managerial professions in estimation (7) comprises employers, managers, professionals, foremen and supervisors. The variable *Student above 30* was dropped from specification (7) because only one individual is a student older than 30 years.

Similar to the findings in table 3, income relative to one's siblings matters less for life satisfaction of individuals that work in lower rank professions. On the other hand, the coefficient on *Siblings worse off* is highly significant for respondents in managerial professions, and is larger than for the overall sample in (2) and also larger than for the above-median income sub-sample estimated in (5). It is furthermore interesting that *Income highly insufficient* is insignificant for the above-median income and the

[7] The resulting sub-sample includes non-supervisory office workers, manual workers, farmers, agricultural workers, members of armed forces and security personnel, the self-employed workers, and those who never had a job, as well as individuals for whom employment type information is missing.

managerial professions sub-samples, while the negative coefficient on *Not employed* is significant in contrast to the results in (1), (2), (3), (4) and (6). These findings indicate that better off respondents on average worry about being unemployed, which may not be an option for the poor. Difficulties to cover the expenditure of needs may have a less immediate meaning in terms of basic consumption for the comparatively better off and their satisfaction with life, while relative status concerns become more important.

4.2 *Econometric Robustness*

While discrete variables do not allow for estimating precise relationship slopes, sign and significance of the coefficient on siblings' income seem robust in the estimations presented. For further robustness checks, the sample has been split by gender, attained education, and by rural and urban respondents. Even though sample sizes change considerably, the coefficient on the worse siblings' income variable remains positive and is significant at the five percent level when estimated for female respondents only. Likewise, *Siblings worse off* is positive and significant in a sub-sample of individuals that have completed at least secondary education or higher. *Siblings worse off* is also significant for exclusive sub-samples of respondents living in areas with less than 100,000 inhabitants, or with more than 100,000 inhabitants. Furthermore, the model has been estimated in expanded specifications, including a range of demographic variables such as age, civil status, and various employment characteristics. As these additional variables have proven insignificant in the estimations, the estimation results are not presented in this paper.

The robustness of the results could be compromised in a case where endogeneity biases coefficient estimates, because measurement errors are not white noise but correlated with the explanatory variables. For instance, absolute income could be mis-measured if individuals mis-report income from informal sector activities. Similarly, habituation and adjustment or different frames of reference could bias subjective variables on health, *Satisfied with living conditions*, or *Problem of inflation*. If systematic measurement errors bias the explanatory variables bias, these errors would cause an attenuation bias in

the estimates. A further concern is the presence of endogeneity if respondents adjust their reference groups to accommodate status preferences, and if a joint factor influences both life satisfaction and income of the endogenous comparison group. While such endogeneity could bias the coefficient on friends' income, this limitation is unlikely to arise for an exogenously given group, such as siblings or other relatives.

As suggested in the literature, endogeneity, which can arise due to omitted variables, measurement error or reverse causality, could pose severe problems in cross-section analyses of life satisfaction. Reverse causality would arise if life satisfaction is a determinant, for instance, of income, employment, health or other explanatory variables (Bertrand and Mullainathan, 2001). In this paper, it unlikely that life satisfaction directly affects these variables. Rather, the problem would be one of an omitted variable bias. If being satisfied with life influences income, it is not strictly life satisfaction that affects income, but an unobservable factor such as 'innate happiness', 'self-respect' or 'optimism' which influences both life satisfaction and income. With the inclusion of the proxy variable *Optimistic*, the potential endogeneity problem was addressed in the estimated models. Despite the advantages of controlling for unobserved fixed effects by estimating panel changes in life satisfaction (Winkelmann and Winkelmann, 1998; Frijters *et al.*, 2004), these advantages are partly offset by the econometric problems arising from estimating changes in ordinal, bounded data, and are not feasible in this paper due to the cross-section nature of the data.

These results suggest that individuals care about income relative to that of their siblings. If income thus confers status, higher absolute incomes can have a zero-sum effect on aggregate utility. In such a case the policy implications are that income should be taxed on efficiency grounds (Boskin and Sheshinski, 1978; and Layard, 1980).

5. Conclusion

The findings of this paper indicate that individual life satisfaction is influenced by income relative to one's siblings. Siblings are a proximate group with very similar

characteristics and opportunities in life, and the importance of income relative to proximate reference groups is consistent with empirical phenomena such as constant reported life satisfaction over time in industrialized countries despite impressive wealth increases, or situations of political stability when income inequality is high and little redistribution takes place.

Everything else constant, individuals seem to be more satisfied with life if on average their siblings earn less. This result points to a curse of comparison, where income gains of one sibling leaves the other sibling worse off in terms of life satisfaction. In the sample used for the estimations, this effect does not hold when the sample is restricted to respondents earning below median income or to those who work in non-professional jobs. These findings are in line with earlier research showing that consumption sharing mechanisms dominate negative externalities of rank concerns for individuals with very low levels of income.

This paper shows that for the sample used, past own income or parents' past living standards do not matter for individual life satisfaction, while the significance of income relative to one's siblings highlights the contemporaneous nature of comparisons. The evidence presented points to the potential zero-sum nature of absolute income increases, and underlines the importance of proximate reference groups for utility derived from relative income.

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Appendix

Table A.1 *List of Variables*

Variable	Definition	Mean	Standard deviation	Min-imum	Max-imum	Number of observations
Own past income worse	Dummy = 1 if current reported income is better since Chávez came to power	0.35	0.48	0	1	400
Friends worse off	Dummy = 1 if the respondent thinks that friends earn on average less per month than the respondent					400
Parents worse off	Dummy = 1 if the parents had a worse standard of living than the respondent when the parents had the same age	0.28	0.45	0	1	400
Siblings worse off	Dummy = 1 if the respondent thinks that siblings earn on average less per month than the respondent	0.26	0.44	0	1	400
Income (in 1,000 bolívares)	Reported monthly income in thousands of Venezuelan bolívares	697.1	755.0	0	5,000	272
Income highly insufficient	Dummy = 1 if income is not sufficient and there are many difficulties to cover needs	0.08	0.27	0	1	400
Not employed	Dummy = 1 if the response to the question "Are you employed?" is 'not employed'	0.40	0.49	0	1	400
Physical health very good	Dummy = 1 if physical health is 'very good' (out of a four-rung scale)	0.42	0.49	0	1	400
Years of education	Minimum years needed to achieve stated education level (‘no education’ = 0, ‘primary school uncompleted’ = 2, ‘primary school completed’ = 4, ‘secondary school uncompleted’ = 10, ‘secondary school completed’ = 12, ‘university uncompleted’ = 14, ‘university completed’ = 17)	12.2	4.3	0	17	393
Years of education^2	Years of education squared	167.3	91.7	0	289	393
Satisfied with living conditions	Dummy = 1 if the respondent is 'very satisfied' *or* 'satisfied' with living conditions	0.63	0.48	0	1	396
Attacks during last year	Number of attacks on respondent or respondent's family in the last year	1.01	1.82	0	20	400
Problem of inflation	Dummy = 1 if the problem of inflation affects the respondent in daily life	0.81	0.40	0	1	345
Political participation	Number of times the respondent participates in political activities per month	3.6	8.7	0	31	400
Political participation^2	Monthly political participation squared	73.2	232.5	0	961	400
Approves of the president	Dummy = 1 if the respondent approves of the current president	0.56	0.50	0	1	368
Satisfied with family situation	Dummy = 1 if the respondent is 'very satisfied' *or* 'satisfied' with his or her own family situation	0.80	0.40	0	1	390
Friends contact per week	Number of times the respondent speaks to friends per week	8.6	10.2	0	90	371
Student	Dummy = 1 if employment type equals 'student'	0.20	0.40	0	1	400
Student above 30	Dummy = 1 if the student's age is equal to or above 30	0.06	0.23	0	1	400
Maracaibo	Dummy = 1 if the respondent lives in Maracaibo	0.20	0.40	0	1	400
Optimistic	Dummy = 1 if the respondent believes that the economic situation of Venezuela will be better in the future than now	0.43	0.50	0	1	400
Missing observation dummies						
Income - missing	Dummy = 1 if monthly income is missing	0.32	0.47	0	1	400
Problem of inflation - missing	Dummy = 1 if information about inflation problem missing	0.14	0.34	0	1	400
President approval - missing	Dummy = 1 if information about president approval missing	0.08	0.27	0	1	400
Friends contact - missing	Dummy = 1 if number of weekly friends contacts missing	0.07	0.26	0	1	400

Note: All summary statistics are for initial values, with the expectation for *Attacks during last year*, which was corrected for one outlier.

Table A.2 *Replacements of missing income observations*

Employment status	Average of observed income (in 1,000 bolívares)	Number of missing income observations replaced
Not-employed student	248	30
Employed student	601	5
Not-employed housewife	292	16
Not-employed pensioner	690	3
Employed pensioner	2,300	1
Unemployed individual (other)	232	19
Not-employed (other)	318	17
Employer or manager of establishment with 10 or more employees	1,269	4
Employer or manager of establishment with less than 10 employees	1,411	3
Professional worker: Lawyer, accountant, teacher, etc.	1,069	8
Non-manual office worker: Non-supervisory	516	1
Non-manual office worker in a public company: Supervisory	826	1
Non-manual office worker in a public company: Non-supervisory	488	3
Skilled manual worker	539	1
Semi-skilled manual worker	421	1
Farmer: Owns a farm	339	1
Self-employed worker	628	5
Average income and total number of replaced observations	457	119

Note: Categories listed do not overlap.

Tables

Table 1 *Percentage of individuals in each life satisfaction category, by subgroups*[†]

	'Very satisfied'	'Satisfied'	'Not very satisfied'	'Not satisfied at all'
All sampled individuals	19%	44%	30%	6%
Income is above sample median	18%	45%	31%	6%
Income is highly insufficient	6%	19%	53%	22%
Respondent works in a managerial position	22%	35%	34%	10%
Physical health is very good	24%	48%	26%	3%

[†] For each subgroup, the respective statement on the left-hand side applies. Figures are percentages of initially observed responses.

Table 2

Ordered probit estimation with robust standard errors

	(1)		(2)		(3)	
Dependent variable:						
Life satisfaction	Coefficient	z-statistic	Coefficient	z-statistic	Coefficient	z-statistic
Own past income worse	0.085	0.58				
Friends worse off	-0.011	0.06				
Parents worse off	0.020	0.14				
Siblings worse off	0.342	2.09**	0.341	2.26**	0.527	2.61***
Income (in 1,000 bolívares)	0.00001	0.12	0.00001	0.11	-0.0002	1.26
Income highly insufficient	-0.509	2.11**	-0.528	2.21**	-0.712	1.98**
Not employed	-0.127	0.90	-0.133	0.95	-0.277	1.28
Physical health very good	0.323	2.62***	0.321	2.61***	0.129	0.70
Years of education	-0.121	2.01**	-0.122	2.00**	-0.047	0.61
Years of education^2	0.005	1.85*	0.005	1.85*	0.274	0.74
Satisfied with living conditions	0.483	3.64***	0.487	3.70***	0.604	3.44***
Attacks during last year	-0.131	3.55***	-0.130	3.55***	-0.060	1.04
Problem of inflation	-0.477	2.85***	-0.475	2.83***	-0.579	2.65***
Political participation	-0.068	1.58	-0.068	1.57	-0.078	1.66*
Political participation^2	0.003	1.94*	0.003	1.94*	0.003	1.93*
Approves of the president	0.400	2.10**	0.426	2.30**	0.117	0.41
Satisfied with family situation	0.704	4.49***	0.695	4.51***	0.844	3.66***
Friends contact per week	0.015	2.66***	0.016	2.71***	0.020	1.90*
Student	0.370	2.42**	0.364	2.38**	-0.085	0.38
Student above 30	0.811	2.77***	0.794	2.71***	1.752	2.79***
Maracaibo	0.412	2.70***	0.413	2.72***	0.571	2.54**
Optimistic	0.416	2.28**	0.456	2.60***	0.847	3.12***
Missing observation dummies						
Income - missing	0.061	0.41	0.055	0.38		
Problem of inflation - missing	0.024	0.11	0.020	0.09		
President approval - missing	0.185	0.85	0.199	0.93		
Friends contact - missing	0.540	2.09**	0.534	2.07**		
Observations	374		374		188	
Log pseudo-likelihood	-348.08		-348.23		-170.18	
Pseudo R^2	0.23		0.23		0.24	

Note: Z-statistics are absolute values. ***, **, and * denote significance of coefficients at the 1-percent level, the 5-percent level and the 10-percent level respectively.

Table 3 *Model estimated for the sub-samples below (4) and above median income (5)*

	Ordered probit estimation with robust standard errors			
	(4)		**(5)**	
Dependent variable:				
Life satisfaction	Coefficient	z-statistic	Coefficient	z-statistic
Siblings worse off	-0.014	0.06	0.613	2.96***
Income (in 1,000 bolívares)	-0.001	1.27	-0.00002	0.12
Income highly insufficient	-0.446	1.34	-0.262	0.76
Not employed	-0.132	0.65	-0.688	2.63***
Physical health very good	0.270	1.48	0.338	1.83*
Years of education	-0.051	0.60	-0.276	2.45**
Years of education^2	0.003	0.56	0.012	2.43**
Satisfied with living conditions	0.170	0.86	0.875	4.50***
Attacks during last year	-0.155	2.09**	-0.13	2.97***
Problem of inflation	-0.478	2.07**	-0.282	1.06
Political participation	-0.042	0.69	-0.074	1.21
Political participation^2	0.002	0.88	0.003	1.50
Approves of the president	0.170	0.71	1.023	3.34***
Satisfied with family situation	0.882	4.18***	0.727	3.13***
Friends contact per week	0.024	3.05***	0.017	1.49
Student	0.276	1.32	1.014	3.85***
Student above 30	0.663	1.83*	0.187	0.44
Maracaibo	0.045	0.23	1.046	4.22***
Optimistic	0.787	3.46***	0.027	0.09
Missing observation dummies				
Income - missing	0.421	2.20**	-0.572	2.25**
Problem of inflation - missing	-0.021	0.07	0.455	1.20
President approval - missing	-0.304	0.81	0.665	2.46**
Friends contact - missing	1.402	3.69***	0.296	0.87
Observations	191		185	
Log pseudo-likelihood	-168.95		-159.43	
Pseudo R^2	0.27		0.29	

Table 4 *Model estimated for non-managers (6) and for managerial professions (7)*

	Ordered probit estimation with robust standard errors			
	(6)		**(7)**	
Dependent variable:				
Life satisfaction	Coefficient	z-statistic	Coefficient	z-statistic
Siblings worse off	0.321	1.50	0.708	2.60***
Income (in 1,000 bolívares)	-0.0001	0.70	-0.0001	0.69
Income highly insufficient	-0.88	2.54**	-0.194	0.41
Not employed	0.063	0.34	-1.228	2.69***
Physical health very good	-0.019	0.11	0.390	1.39
Years of education	-0.177	1.78*	-0.813	2.23**
Years of education^2	0.009	1.88*	0.029	2.16**
Satisfied with living conditions	0.548	3.00***	0.981	3.21***
Attacks during last year	-0.172	3.06***	-0.084	1.72*
Problem of inflation	-0.470	1.91*	-0.680	2.09**
Political participation	-0.093	1.95*	-0.132	1.67*
Political participation^2	0.004	2.16**	0.006	2.10**
Approves of the president	0.302	1.08	0.447	0.99
Satisfied with family situation	0.752	3.40***	0.648	1.78*
Friends contact per week	0.016	2.33**	0.016	0.71
Student	0.258	1.19	0.658	1.54
Student above 30	0.762	2.07**		
Maracaibo	0.164	0.75	0.697	2.00**
Optimistic	0.415	1.63	0.587	1.35
Missing observation dummies				
Income - missing	0.336	1.63	-0.472	1.42
Problem of inflation - missing	-0.049	0.14	0.395	0.86
President approval - missing	0.206	0.71	0.579	1.32
Friends contact - missing	0.497	1.60	-0.576	1.16
Observations	197		107	
Log pseudo-likelihood	-168.81		-96.07	
Pseudo R^2	0.25		0.31	